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Set Name side by side	Query	Hit Count	Set Name result set
	DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR		
L19	('5677955')[URPN]	186	L19
	DB=USPT; PLUR=YES; OP=OR		
L18	(5326959 | 4423287 | 5283829 | 4823264 | 5224162 | 5473690 | 5465299 | 4302810 | 5297202 | 5187351 | 5191613 | 5218637 | 5321751 | 5530755)![PN]	14	L18
	DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR		
L17	('5677955')[ABPN1,NRPN,PN,TBAN,WKU]	2	L17
L16	l14 and 705/26	41	L16
L15	l11 and l14	12	L15
L14	l8 and (anonymous or alias or unknown or ghost) near (customer or person or payer or individual)	265	L14
L13	l1 and l11	1	L13
L12	(internet or www or network or web) and ("e-check" or "electronic check" or "i-check")	736	L12
L11	(internet or www or network or web) and (e-check or "electronic check" or i-check)	736	L11

L10	(internet or www or network or web) and check$ near2 writ$	3288	L10
L9	(internet or www or network or web) near3 check near payment	34	L9
L8	705.clas.	41402	L8
L7	705/1	5682	L7
L6	705/43	598	L6
L5	705/42	655	L5
L4	705/27	2818	L4
L3	705/38	1002	L3
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Active Server Pages Blog News 1997-06-23

The notify_url for a specific payment will be saved, and any subsequent updates to that payment (eg cleared **eCheck**) will be sent to that notify_url. ...
www.powerasp.com/blog/section5/blog-**1997**-06-23.asp - 41k - Cached - Similar pages

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echeck - We gladly accept **echeck** payments via PayPal.com only; please note we wait for ... July, **1997**. ph: 309.721.8949 Outside US - 0011.1.309.721.8949 ...
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INTERNET-DRAFT J. Parsons/D. Shepherd ECML/IETF Expires: May 2001 ...

Check against representative LOC, ACH, **eCheck**, Mobile Phone and PDA processes. 3. ... <http://www.w3.org/TR/REC- html32.html>, D. Raggett, January **1997**. ...
www3.ietf.org/proceedings/00dec/ I-D/draft-ietf-trade-ecmlv2-req-00.txt - 13k - Cached - Similar pages

Systems and methods for ordering and distributing incentive ...

5677955, Oct., **1997**, Doggett et al. 5679940, Oct., **1997**, Templeton et al. ... Landry, The **echeck** market trial: An update, TMA Journal, V19n1, pp:22-25, ...
www.freepatentsonline.com/7003479.html - 114k - Cached - Similar pages

NCSC: Technology: CTC Session Articles

It is called **e-Check** because it replicates the functionality and flow of a ... "Understanding Electronic Commerce," David Kosiur, Microsoft Press, **1997**. ...
www.ncsconline.org/d_tech/ctc/showarticle.asp?id=51 - 35k - Cached - Similar pages

[PPT] ElectraCash Sales Presentation

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eCheck enables customers of merchants to make one-time or recurring payments ... Founded in **1997**, Electracash is a California corporation (headquartered in ...
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Payment by PayPal **echeck** and Credit Cards ONLY For Personal Checks and Money Orders SEE ... (Checks OUTSIDE of the UNITED STATES should use PAYPAL **e-check**) ...

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Will You Take an **E-check**? Feds, Banks Test Electronic Check
inaugurated the first test of the "**e-check**" system for making electronic payments over the ... originally was slated to begin by the end of **1997** but was ...
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[PDF] Microsoft PowerPoint - VISA.ppt
File Format: PDF/Adobe Acrobat - View as HTML
E-check. Other. Online Sales Volume by Payment Type. Source: Jupiter Communications, **1997** Internet Payments Report. 16. Online Sales Growth. **1997** ...
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95 Cadillac Sedan DeVille failed **e-check**, 5/2/2004. EGR VALVE FOR **1997** CADILLAC DEVILLE, 5/2/2004. head bolts holes, 5/2/2004. head gaskets, 5/1/2004 ...
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Walton EMC
E-check works just like a regular check that you fill out on your computer screen. When you pay by **e-check**, the money comes from your checking or savings ...
www.waltonemc.com/Newsletter_Archive/2002_04April.htm - 43k - Cached - Similar pages

Easy Home Bar Plans - Frequently Asked Questions
3D Home Improvement Rec-Room Bar Plans and Remodeling Ideas since **1997**. ... For more information, please read the **e-Check** help section at Pay Pal. ...
www.barplan.com/faqs.htm - 33k - Cached - Similar pages

[PDF] Digital Payment Systems Table of Contents
File Format: PDF/Adobe Acrobat - View as HTML
Electronic payments infrastructure: Design considerations, **1997**. http://www.fstc.org/projects/**echeck**. [FST97c] FSTC. Home page, **1997**. http://www.fstc.org. ...
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Immediate Check (**e-Check**) Deposis provide an instant, secure and easy way to ... Press on the Immediate Check (**e-Check**) logo within the Deposit section. ...

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WU-FTPD Discussion Mailing List: New version of ftpck available.
June 3, **1997**: This has been cleaned up greatly with all ftpaccess records now being checked. ... -**e: Check** _PATH_EXECPATH not == /bin ...
www.landfield.com/wu-ftpd/ mail-archive/**1997**/Jun/0026.html - 39k - Cached - Similar pages

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E-check initiative to launch

By Tim Clark
Staff Writer, CNET News.com
Published: June 30, 1998, 1:00 PM PDT

update In the first transaction in a pilot program for e-checks, the Treasury Department and a group of banking and technology firms said today that an electronic check for $32,153 was sent by email from the Treasury to GTE as payment for an Air Force contract.

Two banks, BankBoston and NationsBank, handled the payment, which will be processed through the Federal Reserve Bank of Boston.

"This is mainstream electronic commerce--this is not marginal consumer stuff," said Mark Greene, vice president of e-commerce for IBM, which provided technology to the banks. "When you have the U.S. government, with very significant risk management policies, we have entered the mainstream business world."

A Treasury spokesman called e-checks "the single most important technology for eliminating [paperwork]" in 2001 and 2002, when government agencies are mandated to move processes online.

"The process of processing a paper check is ludicrously Byzantine," said Scott Smith, e-commerce analyst at Current Analysis, who thinks e-checks may catch on because they cut paper-shuffling for all parties.

Originally announced in October, the pilot had been slated to begin late

last year under the auspices of the Financial Services Technology Consortium, an industry group made up of financial institutions, technology providers, research groups, and government agencies. FSTC spent two years developing a protocol for e-checks.

Participants in the pilot think electronic checks will catch on first with smaller companies, those doing transactions too large for charge cards but too small to justify the cost of financial EDI (electronic data interchange), which involves computer-to-computer transactions on secure private networks.

"E-checks are bank payments safe enough to use on the Internet, and they save everyone handling time, elapsed time, and processing," said Frank Jaffe, director of applied technology at BankBoston. "They don't require significant reengineering, and it's a first step toward going commercial. It's real, it's working, and it's interoperable among different suppliers."

The e-checking scheme parallels how 67 billion paper checks are handled each year in the United States, but eliminating the paper speeds payments and cuts handling costs.

"Because we are using the same legacy systems that produce paper checks, we unplugged our printer and we plugged in an email server," the Treasury spokesman said. "We used the same data in the same format that the legacy system used to process paper checks."

CyberCash and CheckFree already offer e-checks, but frequently those systems are not fully automated and often involve the vendor writing paper checks to pay bills.

In the trial, about 50 government contractors will get paid with e-checks through BankBoston and NationsBank, with the pilot scaling to about 1,000 payments per day with a total value of $1 million a day, Jaffe said.

Singapore's government has said it will conduct an e-check trial later this year, and additional consumer-oriented pilots are expected. Ultimately, participants in the Treasury pilot think electronic checks might be priced at about the same level as paper checks today.

IBM indicated it is discussing trials with major money center banks for both consumer and business usage. It expects to announce consumer-oriented trials by fall.

"We are certainly doing a lot of internal planning and evaluation on how e-checks can be applied to our business," said GTE spokesman Chuck Wade, indicating GTE's seriousness about accepting electronic checks for the hundreds of millions of bills it sends annually to phone customers.

Other technology vendors for the pilot include Sun Microsystems for servers, IntraNet and Canada's RDM for payment software, Baltimore-based Information Resource Engineering (IRE) for smart cards, GTE Internetworking (formerly BBN), the banks for digital certificates, and Certicom for encryption technology.

TRACKBACK

See links from elsewhere to this story.

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Topic: CyberCash

[features] [additional information] [links]

CyberCash is rapidly becoming the de facto solution for collecting money on the Internet. They have a stable online network, relationships with lots of banks, a willingness to forge new relationships where necessary, and best of all, they don't charge an exorbitant chunk of your profit.

We can help you with CyberCash, or we can help you help yourself, in the following ways:

- [go!] We can help you understand the CyberCash service.
- [go!] We can offer you a free AOLserver extension if you want to roll your own solution.
- [go!] We can help you set up the CyberCash MCK on your server and integrate it with your storefront.
- [go!] We offer a complete end-to-end, inexpensive electronic commerce service on our server.
- [go!] We can license you our electronic commerce server to run on your own server.
- [go!] We can help you develop your own completely customized electronic commerce solution.

In short, you name it, we're ready to jump in and help, even if you're using somebody else's software. Really. And we'll answer questions for free, so don't hesitate to ask away.

MCK? What's that?
The term "CyberCash" is often used inaccurately to refer to CyberCash's out-of-box connection software, the Merchant Connectivity Kit (MCK). The MCK is a set of CGI scripts that may be integrated with a merchant's storefront in order to provide connectivity to CyberCash's online transaction server network. However, any software may be used to provide that connectivity as long as it talks to the network correctly. We at Vivtek, for instance, have implemented an interface in Tcl for AOLserver (one of our free downloads.) If you're interested in rolling your own AOLserver solution and want to use our CyberCash integration, just click here to find out more.

The MCK doesn't include shopping-cart functionality, and requires the availability of SSL on your server to encrypt the communication between customer and your server (the MCK *will* handle the encryption between your server and CyberCash, which is an extremely high-level encryption). So you may well be interested in investigating our electronic commerce solution for small business, which takes all that stuff and puts it on our server, where we can administer it easily and you don't have to, and gives you a wide range of services that will help you and your customers have a more effective relationship. We think this is a pretty good option, so please take a look if you're interested in integrating online commerce with your site.

Now that you've sat through the sales pitch, if you want to integrate CyberCash on your own, feel perfectly free to do so. Over the coming weeks, we're going to be including a lot more information about the technical details of CyberCash integration here, so bookmark the page. If you have any specific questions that don't seem to be covered here, visit our answers page to ask us and we'll try to improve our presentation.

MDPs and how to find help
CyberCash has a network of Merchant Development Partners (MDPs), consulting organizations who can assist merchants with the technical issues of integrating CyberCash online transaction processing with their Websites. Vivtek is an MDP, and if you need help with *your* CyberCash integration, then feel free to contact us at any time. We'll be happy to help out, even if it's just to answer your questions. You can also find plenty of other MDPs at the CyberCash website

ADDITIONAL INFORMATION

Here's some more information we have about CyberCash, some of it quite useful.

- **Information for the Internet merchant**
  This is an incredibly useful explanation of the whole online payment thing. Read this if you have any questions at all! We've found this page extremely useful.
- **Anatomy of a CyberCash transaction**
  This is a kind of cute Shockwave cartoon about the steps that a transaction goes through. It's a nice switch from the dense text version of the explanation.
- **Our experiences integrating CyberCash with AOLserver**
  Even if you don't use AOLserver, you might want to check this out for some more perspective on the technical end of the CyberCash service.
- **POP codes returned from CyberCash**
  The first in a series of pages about how to integrate your site with CyberCash. The POP code returns are what you get back after a CC transaction.

FEATURES

- **Free.** CyberCash doesn't cost anything to the merchant in most cases, because the financial institution pays CyberCash for the service. Your bank will charge you for credit card transactions, but they do that anyway for phone transactions, so you're not losing anything.
- **Good merchant support.** Although they can deal slowly with non-emergency cases, CyberCash never fails to respond to a question in a helpful manner.
- **Easy to integrate.** CyberCash has really gone the extra mile to deliver an out-of-box package that is easy to integrate with an existing website. And while technical documentation of the MCK is thin, at least their example code is fairly easy to read.

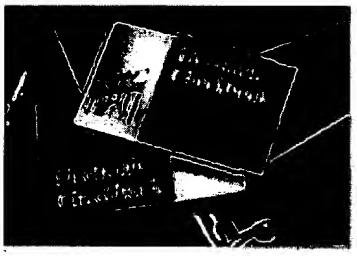
LINKS

- **CyberCash home page**
  Everything you ever wanted to know about CyberCash can be found here, although not always where you would expect to find it, which is one reason we're putting together this topic.
- **Vivtek's ecomm service**
  We don't usually blow our own horn in these links, but this is one case where we'll make an exception. We really think that our solution is good, and our pricing is very low. And it's so much easier to administer than the MCK that we think it deserves looking at. So, sorry. We're linking to it anyway.

Vivtek is physically at 1029 South Dunn Street, Bloomington, IN 47401.
Fax: (801) 705-2845 courtesy of efax.com.
Problems? Try webmaster@vivtek.com or our answer page.

"A significant number of major financial institutions are already licensed to the patent portfolio. We will be offering standard licenses to any interested party, now through July 31, 2003."

Steve Joroff, Director of Licensing, Telcordia Technologies



Market Trials
Phase I of the U.S. Treasury Market Trial came to a successful conclusion in 2000, with over $10,000,000 in payments securely disbursed over the Internet. Phase II, which is now operational, opens up trial participation to a broader community of participants.

Commercialization Efforts
Two startup companies, Clareon Corporation and Xign Corporation, have both licensed the core eCheck technology and are now rolling out new, innovative payment services. Other potential licensing discussions are underway.

Patents Issued
The core eCheck patent (US05677955) was issued October 14, 1997. This patent covers the notion of a digital signed payment authorization, including the concept of a digital signature that remains valid even if sub-documents are removed from the original signed authorization. Two subsequent patents have been issued: US06021202 on February 1, 2000, and US6209095 on March 27, 2001.

In the News:

10/23/02: FSTC and Telcordia to Market Electronic Transaction Patent Portfolio

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The Original "i-che

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PASSWORD

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echecks Vs i-Check

That depends.....

eCheck or Electronic Check is a method of converting a paper check into an electronic This service was developed to reduce the costs associated with accepting checks at the Sale (POS) and to expedite the settlement of funds into the store's bank account throug of the Automated Clearing House (ACH) network. This is the process that is used by a g number of retailers where you hand the cashier a check, they scan it, stamp it VOID, an back to you.

eChecks use a very limited amount of verification, typically one of the national negative databases to determine if the check should be accepted. This minimal verification is suf and NO digital authentication is required because the customer is PHYSICALLY standir cash register where the clerk can see the check, ask for and physically look at the custc identification, plus the check writer is more than likely a local resident.

But what if you can't see your customer, look at his identification, and he isn't loc What if he is making a purchase from your web site?

i-Check or Internet Check is designed for transactions where more complete verificatio digital authentication is not only good business but REQUIRED by the rules that govern transactions. Since you can not look at your customer, look at his identification, look at l check, and he is not from your neighborhood you must use extensive verification metho Check does not simply use a negative database but rather multiple negative databases containing information on known bad check writers, positive databases containing real-t information from your customer's bank about his current bank account status and also fi databases, velocity algorithms, and an extremely accurate address verification system t your customer's name and address. On top of all of the verifications is the i-Check auth where we capture your customers digital signature and meet the requirements of Feder Regulation E which governs electronic transactions. Without the complete comprehensi verifications and authentication that is used by i-Check you run the risk of financial losse fraud and possibly fines from your bank.

There is only one i-Check system. The original i-Check platform has been in continual commercial use since it was developed in 1997. The i-Check system is the only system by thousands of leading e-commerce companies including Fortune 100's, multi-national profits, and financial institutions in over 34 countries.

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The FSTC Electronic Check Project[1]

Ulric J. Gelinas and Janis L. Gogan
Bentley College, Waltham MA

March, 2001

"E-Check is a flexible, secure type of payment that combines the efficiency of electronic funds transfer with the convenience and spontaneity of check writing and the ubiquity of public telecommunications." -- Source: Business Model for the Electronic Check, FSTC, July, 1996

Introduction

In September 1996 the Electronic Check (E-Check) Project Steering Committee of the Financial Services Technology Consortium (FSTC), met with members of the Executive Committee, in preparation for an upcoming meeting with the FSTC Board of Directors to present to the Board the Committee's proposal regarding a pilot trial of E-Check, to be conducted in 1997.

FSTC, comprised of financial institutions, hardware and software companies, government agencies and industry associations (Exhibit 1), was formed in 1993 to sponsor "non-competitive collaborative research and development on interbank technical projects affecting the entire financial services industry." FSTC, a not-for-profit corporation, was headed by a Board of Directors comprised of six banks (see below), which in turn gave day-to-day control of FSTC to an appointed Executive Committee, consisting of representatives from each of the six banks.

Bank	FSTC Executive Committee Member
Bank of America	Steve Fabes*
Bank of Boston	John Doggett*
Chase Manhattan	Adam Backenroth*
Citibank	Dan Schutzer, FSTC President
Huntington Bank	Cary Serif
Nationsbank	Christine Nautiyal

* *These Executive Committee members also served on the E-Check Project Steering Committee*

Organizations participated in FSTC as Principals, Associates, or Advisory members (Exhibit 1).

The September meeting of the Board of Directors would address the question of whether and how to proceed with E-Check pilot tests. FSTC President Dan Schutzer summarized the significance of the pilot tests:

> "This project represents substantial technical risks. Pilot tests will help us determine how this new technology behaves and how well we have ironed out the wrinkles. Pilots will also prove that E-Check has value and will be accepted by bankers, merchants, and consumers. However many pilots we do, each will be a live, public event. Nobody wants it to go wrong in any way, shape or form."

---

[1]Bentley College Professors Ulric J. Gelinas and Janis L. Gogan prepared this case. We gratefully acknowledge the assistance we received from members of the FSTC E-Check Steering Committee and Milton Anderson of Bellcore.

The Internet: Open for Business

In 1996 the Internet linked over 48,000 different networks connecting more than 35 million users in 160 countries. Commercial use of the Internet was initially prohibited, but when these restrictions were lifted in 1993, the Internet "opened for business[2]." In 1994, two innovations in client/server computing had increased the Internet's suitability for electronic commerce[3]:

> server tools: new protocols (such as Hyper-Text Transfer Protocol, or HTTP) for making numeric, textual, graphical, audio and video information available over the 'net's World Wide Web (hereafter, "Web").
>
> client tools: primarily browser software, such as Mosaic and Netscape Navigator, by which users could "point-and-click" on a simple graphical user interface to access the material available on the Web.

Despite explosive growth in the number of companies hosting Web sites from 1994 to 1996 (Exhibit 2) few purchases were actually taking place over this new medium. Merchants, consumers, and financial institutions agreed that security concerns posed a significant deterrent[4]. News stories of stolen credit card numbers and fraudulent funds transfers[5] did little to assuage these fears, nor did predictions -- such as that of Massachusetts-based Forrester Research -- that $1 of every $1000 worth of transactions over the Internet would be fraudulent.

Some saw significant business opportunities despite these security concerns[6]. A 1995 report prepared for MCI by California-based Killen Associates[7] predicted that $600 billion in goods and services, representing 7 billion payments, would be purchased over the Internet by 2000, increasing to $1.25 trillion and 17 billion payments in 2005, and that non-bank organizations, including giant Microsoft, were poised to capture a significant share of transaction fees for online purchases. By late 1995, a wide range of companies jockeyed for position as providers of secure payment mechanisms for electronic commerce -- with no clear industry leader, as one analyst noted: "Expect the Internet to be a payment free-for-all in 1996[8]."

More than 500 banks had home pages on the Web. While most provided one-way marketing information; a few -- including Barclays, First Union, NationsBank, and Wells Fargo -- offered online banking. An all-Internet bank, Security First National Bank, had its initial public offering in May, 1996 (opening at $20 and closing at $41 on its first day). Still, bankers had mixed feelings about Web commerce, as summarized in *The Economist:*[9]

> "The Internet could be another great leap forward in banking. But if the hype turns out to be unfounded ... today's Internet banking pioneers risk becoming tomorrow's laughing stock."

---

[2] Cronin, Mary J. *Doing More Business on the Internet.* NY: Van Nostrand Reinhold, 1995.

[3] Applegate, Lynda M. and Janis L. Gogan, Paving the information superhighway: introduction to the Internet. Harvard Business School Publishing no. 195-202, 1996. Ibid. Electronic Commerce: Trends and Opportunities. Harvard Business School Publishing no. 196-006, 1996. Wilder, Clinton. Pouring cash into the Internet. *InformationWeek*: 15-16, Jan. 1, 1996. See also: A little history of the Web, www.w3.org/pub/www/history.html.

[4] Bhimani, Anish. "Securing the commercial Internet. *Communications of the ACM* 39(6): 29-35, June 1996.

[5] Caldwell, Bruce. Hacking spree targets Citibank. *InformationWeek*, September 4, 1995; Wilder, Clinton and Bob Violino, Online theft. *InformationWeek,* August 28, 1995; Violino, Bob. Your worst nightmare. *InformationWeek*, February 19, 1996.

[6] For example, the security firewall industry (software for protecting systems and data from hacker attacks), estimated at $1.1 billion in 1995, was predicted to grow to $16.2 billion by 2000 (*Investor's Business Daily*, 11/20/95).

[7] Reported in: Holland, Kelley and Amy Cortese, The future of money, *Business Week*, June 12, 1995; and Lunt, Penny, "Payments on the 'net: how many? how safe? *ABA Banking Journal*, November, 1995.

[8] Marx, Wendy, Commerce is slow to hit the 'net, *Advertising Age*, 11/20/95.

[9] *The Economist*, 10/7/95.

The Electronic Check Proposal

From the outset, FSTC members had agreed that banks should play a leading role in developing and hosting secure payment systems. Although numerous start-up and established companies were reportedly developing systems for anonymous digital cash (Exhibit 3), many FSTC members agreed with the American Banking Association's reservations about this approach: "...Ecash can be abused by money launderers and could hurt the financial system by creating a whole new form of money.[10]" In early 1994, FSTC members concluded that no mechanism yet existed that could safely serve all types of transactions and seamlessly utilize both new environments and technologies (the Web, smart cards, etc.) and the existing financial infrastructure (ACH, bank ATM machines, etc.)[11].

FSTC invited experts to make presentations about relevant technologies. In early 1994, speakers from the National Security Agency (NSA) discussed a privacy-enhanced e-mail system, which utilized a PCMCIA card to hold encryption keys. Milt Anderson, from FSTC Advisory member Bellcore, attended this session. Anderson, who received his Master's degree in Electrical Engineering in 1967, was director of a large Bellcore division. He was asked to represent Bellcore on FSTC because he had extensive experience in developing and using various technologies related to network security. The early 1994 presentation triggered an idea, which he explained:

> "A check is legally defined as a signed 'writing,' containing certain prescribed pieces of information. A 'writing' is similar to a 'message.' I thought, this will be easy. A check is a message that carries financial information, like date, pay-to-the-order of, and a few other things. We would develop an electronic "writing," equivalent to the manual version, but cryptographically signed, using the technology of privacy-enhanced e-mail. This approach seemed consistent with existing legal regulations and business practice. In contrast, an entirely new system for digital money would require entirely new legal definitions of money. Although this wasn't as easy as I had hoped, it turns out to be a far more powerful concept than I originally envisioned."

Milt Anderson believed that an "electronic check" would be able to serve a greater variety of transaction types and trading partners, more conveniently and at a lower cost, than other payment mechanisms. He explained:

> "E-Check is a message that tells existing demand deposit accounting (DDA) systems to do credits and debits against existing systems. Encrypted digital signatures will authenticate banks and customer accounts. The code for producing and validating digital signatures will reside on customers' E-Checkbooks (PCMCIA or smart cards), and banks' E-Check servers. Because an online intermediary won't be required to complete a transaction, processing costs will be lower than secure credit-cards or network money systems."

John Doggett, Director of Applied Technologies at Bank of Boston, elaborated on the value of E-Check for customers, merchants and banks (see Exhibit 4):

> "The check is the most popular form of non-cash payment; last year, 65 billion checks were written in the US. Customers understand paper checks. Why not bring their popularity to the electronic world? For banks, E-Check represents the logical next step beyond ECP,[12] which has achieved rapid acceptance. But, with ECP we start with a paper check, which must be cleared and returned to the payer. With E-Check, a nearly identical transaction will be completed, without paper!"

Steve Fabes of Bank of America agreed that merchants would like E-Check because of savings in processing fees (assuming some E-Check purchases would displace credit-card purchases) and time savings in processing

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[10] Lunt, 11/95, *op cit.*

[11] By summer 1996, mechanisms in development or in use (Exhibit 3) included bill payment services (e.g., CheckFree), network money systems (e.g., NetCheque), secure credit-card payment services (e.g., First Virtual), digital cash (e.g., Mondex, DigiCash), and micropayment systems (e.g., Millicent, NetBill, MicroMint).

[12] ECP -- Electronic Check Presentment -- is a system whereby a payee bank sends online notification to the paying bank indicating that a paper check is in transit.

transactions and preparing management reports based on the transaction data. He predicted that banks would see their statement rendering and postage costs drop, and would have faster access to data for improved cash management and other customer services. Costs of legally-required data storage would also drop. Most banks used systems which captured images of paper checks, at about 50K bytes of data per check. Each E-Check would consume only about 4K bytes of data. Adam Backenroth of Chase Manhattan added, "Banks also like the fact that we will preserve their essential role in financial transactions."

Some FSTC members questioned the E-Check concept. One commented, "An electronic check? Isn't that paving over the cow path? Shouldn't we let go of the old money paradigms?" Milt Anderson replied:

> "E-Check also offers many new possibilities. You can selectively add stale dates, maximum amounts, signatures required, and other restrictions to checks. A parent might restrict how much a child can spend; a bank might insert controls requiring customers to return to the bank periodically to become re-certified. Invoices, remittances, or other documents could be attached to E-Check, enabling businesses to design more efficient cash receipt and disbursement processes. Optional full-message encryption can be used for sensitive transactions, while the majority of transactions can be transmitted over non-secure channels in clear-text form without financial risk to payer, payee or the banking system (thanks to the use of certificates and digital signatures)."

Doggett added, "With these capabilities, you wander off the check paradigm altogether. Now you have an instrument that can resemble a certified check, a traveler's check, or something altogether new."

After considerable discussion, 25 FSTC members chose to participate in the E-Check project, which was charged with "investigating what is required to successfully deploy the Electronic Check for use in the marketplace." The Electronic Check Project was one of several initiatives sponsored by FSTC,[13] each governed by a Steering Committee consisting of three Executive Committee members plus a full-time project manager. John Doggett served as director of the E-Check Project Steering Committee, comprised of himself, Steve Fabes of Bank of America, Adam Backenroth of Chemical Bank, and Frank Jaffe of Bank of Boston. Jaffe, who had worked in the Bank's information systems organization for ten years and held a master's degree in computer information systems from Dartmouth College, was the E-Check Project Manager, and Milt Anderson headed up the technical design.

By summer 1995 an initial E-Check design specification had been agreed upon, and the team began preparing for a public demonstration of a live E-Check transaction in September 1995.

Proof of Concept

Members of the press and bankers were invited to a demonstration in September, 1995 at Bank of America in San Francisco. FSTC president Dan Schutzer opened the meeting with a brief discussion of FSTC's charter. Next, Mark Greene -- IBM vice president of electronic commerce -- described how E-Check fit IBM's "netcentric" strategy, and Humphrey Polanen, General Manager of Sun Microsystems' Internet Commerce Group, described how Sun was helping to "transform banking." He added, "One thing is certain -- bankers' hours are a thing of the past; systems like E-Check will give customers around-the-clock banking."

To demonstrate E-Check (see Exhibits 5 and 6), FSTC member Frank Carnella[14] stood at a Web-connected computer on one side of the room. "E-Check is flexible enough to use over the Web or a proprietary network like America Online. I can use a browser (such as Netscape Navigator, which I have here), or simple e-mail." Carnella brought up the Web site of PC Gifts & Flowers (www.pcgifts.ibm.com/), a Virginia gift shop. There he selected a teddy bear. "The order information will be included in the E-Check 'attachment' block," he explained. As he inserted his E-Checkbook into the PCMCIA slot on his PC, he explained:

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[13] Details of the other FSTC projects can be found at URL: http://www.fstc.org.

[14] Frank Carnella represented Chemical Bank on the FSTC. Subsequently, Chemical merged with Chase Manhattan.

> "The E-Checkbook is a tamper-resistant 'token' which uses public-key cryptography.[15] My particular E-Checkbook token is a PCMCIA card, but a smart card works equally well. My E-Check account private key is securely stored in the tamper-resistant memory of this token. Only by keying my PIN can my private key be used to sign the check. Because it is stored off-line, my private key is not available for misuse, provided I do not reveal my PIN to anyone. The E-Checkbook will generate check numbers[16] and a nonce (random information to uniquely identify each check) and will log transactions in a register.

Following instructions on his PC screen, Carnella filled out the pay-to and amount information. He explained:

> "The software for creating E-Checks could be bundled with a Web browser, included as an optional module in products like Quicken, or delivered as a standalone product. This software is putting my digital signature in the E-Check signature block, then adding two cryptographic certificates[17] for Chemical Bank and for my bank account on the E-Check. These certificates will verify that my public key can authenticate my digital signature on checks drawn on my account. The signature block of the check contains secure hash codes[18] of other blocks (e.g., account, amount, attachments, certificates) in the check. This binds the blocks together in a logical unit which is protected against tampering or incomplete transmission."

John Doggett added:

> "By clicking on 'Sign Check,' Mr. Carnella digitally signed his E-Check, and sent it -- 'attached' to his teddy bear order and containing a certificate authenticating that he is a valid customer of a valid bank (Chemical) -- out over the Internet to PC Gifts & Flowers. The shop will process the order, by electronically submitting data on the order attachment and E-Check to its own accounting and order fulfillment systems. The shop's software might also review the order and check to ensure that the order and check came from the same customer and that neither the check nor the order has been altered or previously processed. The shop will endorse the E-Check with its digital signature; that is, PC Gifts & Flowers' checkbook will place its digital signature in the E-Check endorsement block. This is equivalent to endorsing the back of a paper check. By the way, endorsements can be restrictive, such as "for deposit only." Since PC Gifts & Flowers uses Bank of Boston, two certificates -- for Bank of Boston and for PC Gifts & Flowers' account at Bank of Boston -- will be included. Now the shop will forward the E-Check, over the Internet, to Bank of Boston."

Doggett then explained that Bank of Boston would use the certificates on the E-Check to validate PC Gifts & Flowers' account, to ensure that the credit would be applied to the correct account. Then the bank would process the payment (by electronically submitting data on E-Check to its own accounting information systems). "The Bank might review certain details about the check," he noted.

> "The bank might check simple rules like 'stale-date at 90 days' or 'checks on this account require two signatures if they are over X dollars', or 'the minimum check is Y dollars in this account,' or 'this check requires endorsement by both payees instead of one payee'. Many (though not all) such restrictions can be expressed in the check itself."

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[15] There is a mathematical relationship between a public key and a private key. Information encrypted with a public key can only be decrypted with its private key, and vice versa. The size of keys, 250 (or more) digits, makes it infeasible for an attacker to "crack" them. A private key is held completely private, whereas a public key is freely available.

[16] To minimize attacks against the paper check system, E-Check account numbers would be uniquely different from any paper check accounts held by the bank customer.

[17] A cryptographic certificate is an electronic document containing a public key and information about the key, such as the user's name, cryptographically signed by a certification authority.

[18] Secure hash algorithms are calculations that determine the exact digital composition of a block of data.

> "If everything checks, PC Gifts & Flowers' account will be credited, on Bank of Boston's legacy DDA system, and the check will be cleared[19]. Later, the deposit will appear as an E-Check line on PC Gifts & Flowers' next statement."

Next, Doggett explained, Bank of Boston would send the E-Check through ACH or another clearing mechanism. ACH would credit Bank of Boston's account, debit Chemical Bank's account (thus settling the transaction), and forward the E-Check to Chemical Bank (the payer's bank). Chemical's E-Check server would verify that the E-Check was intact, and review the transaction for proper authorization and compliance with rules and restrictions, and to detect that the transaction was not a duplicate. If everything checked out, Frank Carnella's account would be debited and the transaction included as an E-Check line on his next statement.

Reporters asked questions about what they had witnessed. One asked, "How essential is the separate token (the PCMCIA card)? That will be an extra expense for customers to bear." Adam Backenroth of Chase Manhattan Bank replied:

> "It is essential. We believe that security can be too easily breached when private keys are held on a user's PC hard drive. A separate token provides far great assurance that users' digital signatures are valid. Partly this is a matter of perception: a small number of security failures can give rise to a large loss of consumer confidence. Offline storage of buyers' and banks' certificates is a strong preventive measure. Besides, industry reports show that most personal computers will be sold with PCMCIA slots, so there will be little added expense for customers with new machines."

A banker asked, "Will processing costs be significantly lower with E-Check?" Steve Fabes of Bank of America replied, "We believe it will be cost-effective in comparison with conventional payment systems and alternative online payment mechanisms."

Another banker asked, "Can you explain about certificate authorities?" FSTC and other industry groups[20] had discussed what was necessary to positively authenticate buyers, merchants, and banks. Milt Anderson explained:

> "The E-Check design will utilize two certificate authorities: one to authenticate a bank, and one to authenticate a valid account-holder (buyer or seller). E-check processing will involve a hierarchical process of passing through the certificate chain, as follows: The public key of a root authority (such as the Federal Reserve) will be used to verify a payer bank's signature on its certificate (one block of the E-Check). The public key contained in the payer bank's certificate will be used to verify the signature on the customer's bank account certificate. This serves almost as a 'letter of reference' from the bank saying, 'this signer's public key can be used to verify signatures on checks from this account.' The software then authenticates the check signature."

He added, "This authentication process has two advantages: the authenticator need only know the public key of the top-level certificate, and the payee and payer need not know each others' public keys to conduct business."
A reporter, looking puzzled, asked: "Suppose an E-Check is made out to, endorsed by, and deposited by a legitimate payee. Now an attacker grabs the E-Check, makes a copy, adds their endorsement as if they were a third-party. What then?" Steve Fabes replied, "I agree this is a serious issue. In my opinion, banks will probably need to disallow or severely restrict third-party E-Check endorsement."

Another banker stated, "Network nodes crash all the time and messages have to be re-sent. When that occurs, how will banks know that checks have not been erroneously duplicated?" Adam Backenroth fielded this question:

> "The E-checkbook will apply a unique serial number to each check. If a bank does receive identical checks, it should pay only one. Banks will need to develop enhanced duplicate detection routines,

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[19] Although the technology would permit virtually instantaneous clearing, the E-Check team expected that a one-day clearing process would be used, since consumers currently expected some "float" in their financial transactions.
[20] See, for example www.rsa.com/search/iatoc and www.verisign.com/about/corpcap.html.

> and keep a database of processed E-Checks. Also, with E-Check it will be easy to apply shorter stale-date intervals where appropriate -- perhaps 90 days, instead of the current norm of 180 days."

Steve Fabes added:

> "We take the duplicate check threat quite seriously. We know that today, banks do forensic tests on paper checks to determine if they are originals or duplicates. We are confident that E-Check will provide stronger capabilities for preventing and detecting fraudulent or erroneous duplication."

After several more questions, the event was brought to a close. The E-Check team felt that the demonstration generated excellent publicity; however, substantial "technical and political hurdles" would need to be overcome as the project moved from "proof of concept" to well-defined prototype to fully functional system. Doggett noted:

> "It would be great if Congress could wave a magic wand and decree that the electronic check shall be the financial instrument of the future; but that's not the real world! A pilot test will answer the objections of people who say it won't scale, it will be too costly, inefficient, insecure, cumbersome. Once we put it to use with real customers in a real situation, we can put those issues to bed."

In January, 1996 the E-Check Steering Committee presented a progress report to the Executive Committee. In turn, FSTC President Dan Schutzer presented a proposal for the next phase of the project to the FSTC Board of Directors. The Board approved the request to move forward with the project, subject to 32 stipulations. Of these, two key stipulations, in Doggett's opinion: No live pilots were to be conducted without prior approval of the board, and all pilots should involve participation by multiple banks. During winter and spring, 1996, some team members -- coordinated by Milt Anderson -- focused on refining the technical design, while others, coordinated by Frank Jaffe -- identified and evaluated pilot test opportunities.

Implications for the Banking Infrastructure

Frank Jaffe explained what a bank would need to have in place to process E-Checks:

> "Each bank will need an 'E-Check Server' (either a standalone server or software which is added to an existing system), which will do all of the bank's cryptographic processing and translate between E-Check and the financial data necessary for posting a transaction. Without this software, legacy systems (e.g., demand deposit accounting systems) won't recognize E-Checks. Some banks will already have functions in their legacy systems to check restrictions and to post transactions. The bank will choose how to enforce its rules or restrictions, such as what to do if an E-Check is not covered by sufficient funds (some banks will return all such checks; others will see this as a great opportunity to cross-sell an overdraft line of protection)."

In addition to receiving incoming e-checks and applying business rules, the E-Check server would have a database and an optional E-Check research work station, which would be used to analyze faulty checks (such as duplicates).

The E-Check architecture specified the use of existing clearing mechanisms and regulations, as Steve Fabes explained:

> "The existing financial infrastructure is sensitive and trusted. To keep that intact and avoid exposing it to threats from the public network, we will pass authenticated messages only from payees to the clearing system. There is no log on, no file transfer, no connection between the Internet and the mechanisms that clear the check."

Unfortunately, existing regulations had not yet determined whether E-Checks should be considered checks, ACH debits, or a new payment mechanism. Frank Jaffe explained:

> "Checks and ACH debits are governed by different bodies of law and the law determines who assumes the risks and responsibilities of processing the payment. If E-Check is considered a simple "check," the

> transaction will fall under check law (Uniform Commercial Code articles 3 and 4) and Bank Regulation E. Under check law, the payer's bank may be liable unless they promptly return an E-Check to the bank of first deposit. They must verify the item and decide whether to accept responsibility for it within a specified time interval. In another scenario, an E-Check is cleared as an ACH debit, which is subject to NACHA (National Automated Clearing House Association) rules. Under NACHA rules, the bank of first deposit (i.e., as "originator" of the debit) would be liable for ACH debits, and thus would become more vulnerable to the risk of duplicate checks (the bank of first deposit would not know whether someone had intercepted a check, endorsed it, and submitted it to two payees, each with its own bank of first deposit).

Consequently, banks of first deposit would probably prefer to treat E-Check as a check. In fact, the E-Check team was neutral to either a check or ACH debit implementation, since E-Check would enhance both of these existing bank settlement mechanisms. Adam Backenroth explained:

> "Because authorization for an ACH transaction remains with the originating bank, an ACH transaction can be reversed if a receiving institution or payer claims that it was not authorized, or if funds in the payee's account are insufficient. Bankers prefer clean transactions -- ones that cannot easily be reversed. The best way to get a clean transaction, to ensure that a payment is authorized and that funds are available, is with an immediate debit or via certified check, and this is slow and costly.[21] Another approach is to tie the instruction for issuance to the transaction. With any check, the payer demonstrates authorization by signing the check. E-Check improves that further: the digital signature is proof that the customer ordered that payment. Certification would be required to guarantee that the funds are sufficient."

Pilot Planning

The pilot would be a live application, addressing a real need of a particular business. It would be designed with scalability in mind, as Milt Anderson noted:

> "Today, only a few thousand transactions per day are conducted on the Internet, but once secure payment mechanisms like E-Check are in place, that will skyrocket into perhaps tens of billions of dollars' worth of transactions. We don't know how to accurately predict network response times under that scenario (already, the Web slows to a crawl in the afternoon), and we don't know whether banks' E-Check servers can handle that kind of processing load."

In meetings of the E-Check Steering Committee and the FSTC Executive Committee, much discussion centered on how the pilot test should be designed, and who would participate. Dan Schutzer emphasized "nobody will be coerced or pushed into this. Participants should be driven by a desire to solve a particular business problem." In spring, 1996 Frank Jaffe reported: "There is no shortage of people wanting to participate in the pilot."

> "However, it's proven somewhat problematic to find the perfect pilot. We thought that a business-to-business application would be a sensible first step, since it would represent a reasonably bounded universe of payers and payees, compared with a retail environment. However, some proposed participants use open-account billing, which would not generate enough transactions to adequately test the system. Also, a business-to-business pilot begs the question of whether E-Check will work in a retail or government environment. Furthermore, some proposed participants have low credibility in their industries. This is not an easy task."

Most team members agreed that several pilots should be conducted, drawn from business-to-business, consumer, and government settings. One suggested that the pilot be conducted inside an organization (for internal budget transfers); but another member felt this was inappropriate, since a bank would not be involved. Some people questioned whether it was necessary to conduct pilots over such a broad range of settings. One noted, "Wouldn't we make faster progress if we focused on a particular domain, like small merchants?" Milt Anderson from Bellcore addressed this question:

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[21] The E-Check architecture will make available an optional Certified E-Check capability, which would ensure sufficient funds.

> "Yes, there is a risk of becoming distracted by looking across a very broad application domain. However, two things are certain: technologies will change, and the business environment will change. It is prudent to keep the design principles general -- which requires avoiding an emphasis on application-specific requirements -- even if that means slower progress."

John Doggett commented, "A pilot is a feasibility test and a clean, noticeable deliverable that shows we have made progress. Call it what you will, it must be done soon."

"Time is Up!"

During the summer, numerous pilot-test ideas were analyzed (Exhibit 7). Once specific pilots were chosen, the prototype would be adapted to fit the particular requirements of the pilots. Then, the revised system would be made available to a team of security experts at Sandia National Laboratory (another FSTC Advisory member), who would attack the system to find security weaknesses in it. Anderson described the expected outcomes of this "black-hatting[22]" exercise:

> "We need them to search for flaws with fresh, adversarial eyes, because the system designers undoubtedly overlooked certain aspects. It's pretty much a given that Sandia Labs will find a way to break the system. Then they will offer suggestions for -- I hope!-- minor design changes."

In early September 1996, the E-Check Steering Committee met with the FSTC Executive Committee. The E-Check project was on the agenda for the FSTC Board of Directors meeting in a few weeks. The team would present a proposal for specific pilot tests, to be conducted early in 1997. "Time is up," FSTC President Dan Schutzer stated. "Have you decided on the pilot tests you want to propose to the Board? We will also want to know how the pilot results will be evaluated. By what criteria? Through what measurement mechanisms?"

[22] In US cowboy films of the fifties, the "bad guys" typically wore black hats.

Suggestions for Further Reading

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Exhibit 1

FSTC Membership as of August, 1996.

Members highlighted in **bold** participated on the Electronic Check Project team.

Principals	*Associates*	*Associates, cont'd.*	*Advisory Members*
Bank One	**American Express**	**Intranet, Inc.**	American Banker Association
Bank of America	AT&T-GIS	**IRE, Inc.**	Bank Administration Institute
Bank of Boston	**Bank of Montreal**	Lifecycle Technology	**Bellcore**
Barnett Bank	Beneficial Tech. Corp.	Master Card International	**ECCHO**
Cardinal Bank Shares	**Bolt, Baranek, Newman**	MITRE	Lawrence Livermore Laboratory
Chase Manhattan	Broadway & Seymour	Motorola	**NACHA**
Citibank	Copyright Clearing House	**National Semiconductor**	**NY Clearing House**
Corestates	CU Cooperative Systems	NEC	NE Parallel Architecture Center
Glenview State Bank	CUNA & Affiliates	**Novell**	NSA
Huntington Bank	Cybercash	OKI America	**Oak Ridge Nat'l Laboratory**
NationsBank	DEC	Premenos	Open Software Foundation
Wells Fargo	Deluxe Corp.	Proprietary Fin'l Products	Polytech Univ. of Brooklyn
	Equifax Check Services	**RDM Corp.**	**Sandia National Laboratory**
	First Virtual	**Sun Microsystems**	US Postal Service
	Ford Motor Credit	Tandem Computers	**U. of Southern California**
	GTE Gov't Systems	**Telequip**	
	Hewlett Packard	Tower Group	
	IBM	**Unisys**	
	InfoStructure Svc & Tech	Visa	

Exhibit 2

Growth of the Web

Month	Number of Web Sites	Percent .com
6/93	130	1.5%
12/93	623	4.6%
6/94	2,738	13.5%
12/94	10,022	18.3%
6/95	23,500	31.3%
1/96	90,000	50.2%

Source: Matthew Gray, netGenesis Corporation.
URL: http://www.netgen.com/info/

Exhibit 3
Comparison of Electronic Payment Mechanisms
adapted from internal FSTC documents; updated to summer 1996

Bill Payment Services: CheckFree (www.checkfree.com), Columbus, Ohio (founded in 1981): leading provider of bill payment services. Individuals or small businesses provide CheckFree with lists of payment recipients (e.g., landlords, utilities), and each month indicate how much to pay and on what date.

Network Money Systems: Payers and payees enroll with an Internet payment intermediary, which has an Internet server that encrypts and translates payee and payer data before forwarding it to traditional clearing mechanisms. NetCheque (http://gost.isi.edu/info/NetCheque/), developed at University of Southern California: uses Kerberos (private-key encryption) to encrypt and transmit payment data.

Cybercash (www.cybercash.com), Reston, Virginia: Secure Internet Payment Service uses 768-bit public/private key encryption algorithm.

Secure Credit Card Payment: First Virtual (www.fv.com), San Diego: customers provide card numbers to FV via telephone, and receive a VirtualPIN, which serves as an alias for the actual credit card number. To make a purchase, a member gives a merchant their VirtualPIN. The merchant (who never sees a buyer's card number) instructs FV to process payment for the holder of this VirtualPIN. FV takes the PIN offline to find its matching card number (stored on a standalone computer), then completes the transaction through conventional means.

In 1995 MasterCard, Visa, IBM, Microsoft and Netscape disagreed about which specific protocols to use for secure Internet transmission of credit card data, and who should control (and profit from) their application. In February 1996 they reached agreement on an openly-published protocol, SET (Secure Electronic Transactions). In June 1996 VeriFone, Inc., of Redwood City, California (the market leader in credit-card processing technology), announced that it would offer SET-protected credit card transactions on the Web (working with Wells Fargo Bank, Royal Bank of Canada, and Novus Services)[23]. In July MasterCard and GTE announced their SET-based on-line verification service, CyberTrust (to issue digital certificates of identity to banks, consumers and merchants); Visa and VeriSign (www.verisign.com) made a similar announcement[24].

Digital Cash: In fall, 1995 Amsterdam-based DigiCash (www.digicash.com) began testing "Ecash" in the US, in collaboration with Mark Twain Bank of St. Louis, with 4000 customers and 70 merchants. Ecash customers purchase fixed-denomination software "tokens," which are stored on user's PC hard drive or a smart card. Each token has a unique, encrypted serial number that cannot be traced to the payer. When payment is made, only the serial number is authenticated online; payer is anonymous.

In Great Britain, National Westminster Bank and Midland Bank jointly developed Mondex wallet (www.mondex.com), which works with specially-equipped telephones, personal computers, card readers and cash dispensers. In Swinden, Great Britain, 10,000 customers and 800 merchants began participating in the Mondex Wallet trial in July 1995.

A large-scale US trial of smart cards took place during the summer 1996 Atlanta Olympic Games, using a system jointly developed by Visa, NationsBank, First Union, and Wachovia. Microsoft was reportedly developing a similar system, and Citibank filed for patent protection in 40 countries for its Electronic Money System.

Also under development: "micropayment" schemes, aimed at extremely low variable processing costs to support pay-per-page or pay-per-word transactions. Key aspect: efficient processing allows for cost-effective fractional charges for small "chunks" of online information (such as one-page articles). Others' transaction costs would be greater than the value of items this small, according to micropayment proponents. Early efforts: NetBill (Carnegie Mellon University), Millicent (Digital Equipment Corporation), Pay Word and MicroMint (RSA Data Security).

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[23] Clark, Don. VeriFone sets Internet payment system for banks to sell, lowering Web barrier. *Wall Street Journal*, 6/18/96.
[24] Sandberg, Jared. Visa to introduce codes to protect on-line purchases. *Wall Street Journal*, 7/22/96.

Exhibit 4

Benefits of E-Check

E-Check ***enables banks to gather deposits electronically:*** E-Check addresses the problem of gathering deposits electronically over public networks, since it enables all customers, retail and commercial, to gather, transmit and deposit E-Checks into their accounts without physically going to a bank branch.

E-Check fills an electronic commerce payments void: E-Check addresses a gap, which banks can fill, in the payments infrastructure; specifically, the lack of an electronic payment alternative for trading using public data networks to conduct transactions.

Rapid adoption: E-Check is an all electronic payment instrument, modeled on existing paper check processes to enable it to be readily accepted by the marketplace. By retaining the basic characteristics and flexibility of paper checks while enhancing functionality, E-Check can be adopted more rapidly.

Great flexibility: The E-Check design enables great flexibility, through support for other types of payment instruments -- e.g. certified check, cashiers check, credit card chart slip, etc. -- and added capabilities, such as future data, limit checks, and multi-currency payments.

An efficient alternative for both consumer and corporation: E-Check can be used advantageously in all market segments, from individual consumers to large corporations as it will enable businesses to safely complete payments over the networks in a more cost effective manner than present alternatives.

Automated posting of accounting information: Since the contents of a check can be attached to the trading partner's remittance information, E-Check will easily integrate with existing or new applications, such as accounts receivable. In addition, E-Checks can be integrated into other payment systems...

A secure, trusted instrument: Building a secure, trusted, workable payments option for electronic commerce requires an in depth understanding of the options, problems, and barriers to acceptance from the perspectives of consumers, businesses, and financial institutions. The use of digital signatures, hardware based signing, and banks as certification agents, will make E-Check trusted and secure.

Open integration with existing inter-bank payment mechanisms: The secure E-Check document enables open public networks to be linked to the financial payments and bank clearing networks in a secure fashion, leveraging the ubiquitous access of public networks with the existing financial payments infrastructure.

Authentication of E-Checks: Using public-key certificates enables E-Check authentication by payee, and payee and payer banks, a feature that is not available today for paper checks. Digital signatures can be validated automatically, while today's paper checks require a manual process, which can only be done by the payer's bank, to compare handwritten signatures.

Source: FSTC, January 1996. (available on the Web at ...echeck/echeck2.shtml)

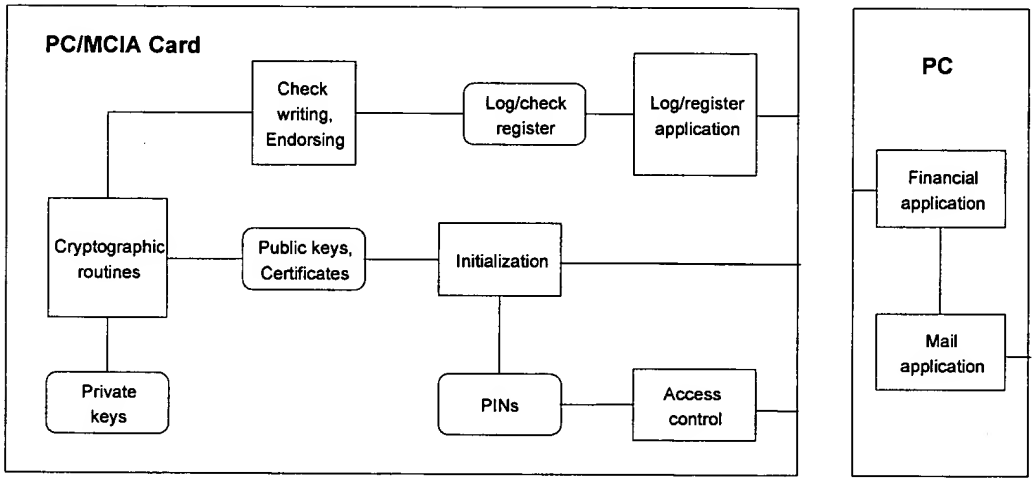
Exhibit 5
E-Check Design

E-Check Block Types

Block Type	Definition
Action	Describes the action to be performed
Signature	The signatures and hashes of other blocks
Check	An electronic check
Deposit	A deposit slip attached to one or more checks
Endorsement	An electronic endorsement, attached to a check
Account	Account information
Certificate	A public key certificate
Attachment	An associated document (e.g., order form) attached to an FSTC document
Invoice	An invoice/remittance document containing payment information
Message	An informational message, such as an error report
Bankstamp	Processing status information
Bundle	Used to combine a group of checks for inter-bank transmission

Source: FSTC E-Check Architecture Document, June 1996

Electronic Checkbook



Source: Presentation by Milt Anderson, June, 1996

E-Check Flowchart, Exhibit 6

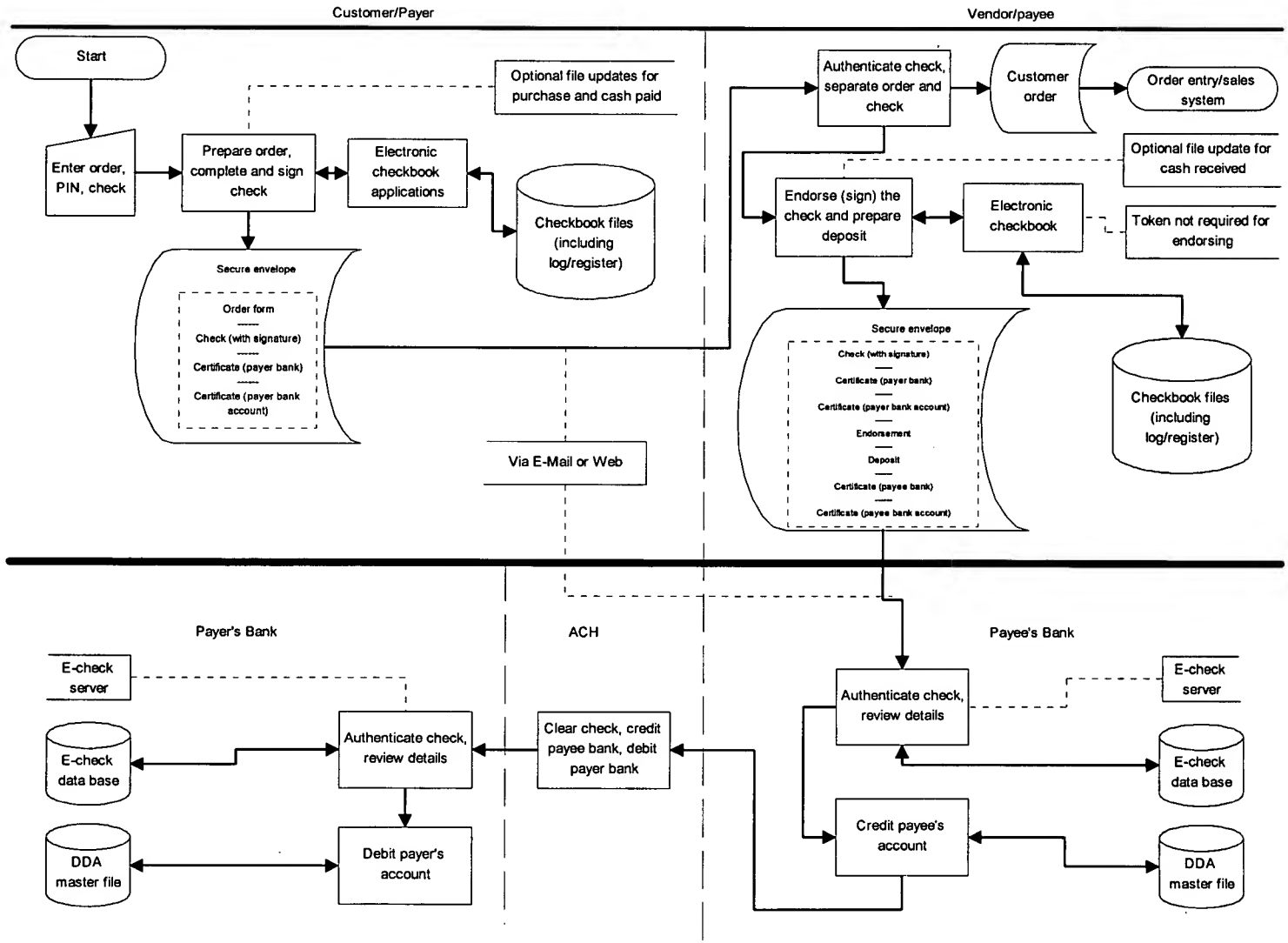


Exhibit 7

E-Check Pilot Proposals Under Consideration

Source: FSTC documents, August 1996

Application	Description
Business to Business Applications	
1. Computer Manufacturer Accounts Payable: payments to suppliers	Two manufacturers made substantial investments in EDI, but their suppliers balked at the $150,000 investment each would have to make in proprietary software, as well as charges associated with use of a value-added network.
2. Library Subscription Agency: online payment for periodicals.	This company developed Web-based software to improve customer service and repetitive-order processing efficiency, and seeks an inexpensive, secure mechanism for immediate payment that does not require EDI (since many libraries are not yet EDI-enabled).
3. Medical Center: transactions among doctors, suppliers, insurers	When physicians see others' patients, checks may be sent to and from referring physicians, medical laboratories, one or more insurance companies, medical suppliers, etc. In medical centers, these amount to a large volume of transactions, a large percentage of which are currently via paper check.
4. Payroll Processing Service	Existing payroll services must make payments as much as 72 hours before actual distribution of payroll. A start-up company wants to offer a faster-cycle Internet-based payroll service to cost-squeezed smaller businesses.
Consumer Applications	
5. Independent Brokerage	Small broker wants to introduce Web-based service; can't accept credit-card payments due to SEC regulations.
6. Virtual Shopping Mall	Host of Web-based shopping "mall" wants to be able to accept both credit-card payment and other forms of payment.
Non-Commercial Applications	
7. US Federal Government: payments to suppliers	US Vice President Al Gore promotes increased use of the "National Information Infrastructure" by government agencies. EDI is emphasized, but many suppliers are not yet EDI-enabled. Currently, a very high volume of check-based transactions are conducted.
8. US Federal Government: inter-agency payments	Currently, many checks are exchanged for inter-agency payments.
9. Employee Travel Reimbursement	Large company wants to improve its control over this large expense item. Lots of checks being cut already.
10.Responsibility Accounting System	Operationalize (with real funds, rather than "funny money") the recording of expenditures against authorized amounts.

2613843/9 **Links**
TecInfoSource

02613843 **Document Type:** Company
CyberCash Inc (613843)

2100 Reston Pkwy 3rd Floor
Reston , VA 20191 United States

Record Type: Directory

Contact: Sales Department

Organization Type: Corporation
Status: Company Sold

CyberCash Incorporated is a provider of electronic payment solutions. CyberCash's products, Secure Payment/SET (TM) and PAYNOW (TM) electronic check, allow online vendors to accept credit cards, checks, and other forms of payment. The company has a worldwide export license for the 1024-bit RSA encryption algorithm, which allows secure digital signature-based online credit card verification. CyberCash was founded in 1994 and has its headquarters in Reston, Virginia, and a global network of offices. It is now part of VeriSign.
Sales: NA

Date Founded: 1994
Immediate Parent: VeriSign Inc
Descriptors: E-Commerce; E-Payment; Internet Marketing
Revision Date: 20020430

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